THE CHEMISTRY OF SOYBEAN PHOSPHATIDES

BY

WALTER DANIEL CELMER

B.S., Bucknell University, 1947

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN CHEMISTRY
IN THE GRADUATE COLLEGE OF THE
UNIVERSITY OF ILLINOIS, 1950

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Introduction

In 1939, Klenk and Sakai (1) first reported the presence of inositol in soybean phosphatides. In 1943, Woolley (2) announced the isolation of an inositol-containing lipide "lipositol" from this source and described its properties and composition. After attempts to duplicate the isolation of "lipositol" were unsuccessful, a thorough study of the composition and fractionation of soybean phosphatides was undertaken.

Discussion of Results

In the course of studying the composition of soybean phosphatides, lecithin, cephalin and inositol lipides have been isolated in addition to non-lipide components, such as, sterol glucoside and water-soluble materials including inorganic salts, organic phosphate ester and carbohydrate giving positive Seliwanoff and diazouracil tests.

The following fractionation scheme has been developed for the preparation of inositol lipides. Crude soybean phosphatides from various commercial sources were freed of oil with acetone, and the product (3 per cent inositol) was extracted with glacial acetic acid. The residue was a crude inositol lipide (10 per cent inositol) which represented 25 per cent of the original weight and 80 per cent of the original inositol.

Lecithin, cephalin and unbound sugars were obtained from the glacial acetic acid extract. Paper partition chromatography of the carbohydrate revealed two spots whose R_F values were the same as those of sucrose and stachyose.

The crude inositol lipides were purified by an aqueous acetic acid-benzene distribution. Lyophilization of the benzene lipide solution gave a white powder (Seliwanoff test negative), whereas the aqueous acetic acid fraction gave a

strong, positive test. In addition to carbohydrate, the aqueous acetic acid fraction contained inorganic salts and inositol phosphate.

The benzene-soluble fraction was purified further by an ethanol:chloroform extraction which removed non-inositol containing material, including sitosterol-D-glucoside. The residue (12 per cent inositol), after distribution between hexane and 95 per cent methanol, gave two inositol lipides. The more hexane-soluble fraction was characterized by content of glycosidic-bound sugar, while the more methanol-soluble fraction was void of carbohydrate.

The described procedure has been utilized for the preparation of inositol lipides from linseed and corn phosphatides, as well as from soybean phosphatides.

Summary

Soybean phosphatides have been investigated primarily in regards to inositol lipide composition. A new fractionation procedure has been developed for the preparation of inositol lipides, lecithin, and cephalin from soybean phosphatides. This method removes non-lipide components, such as sitosterol-D-glucoside, inorganic salts, inositol phosphate, sucrose and stachyose.

The existence of two types of soybean inositol lipides was indicated by solvent distribution studies.

BIBLIOGRAPHY

1. Klenk, E. and Sakai, R., Z. physiol. Chem., 258, 33 (1939)

2. Woolley, D. W., J. Biol. Chem., 147, 581 (1943)

VITA

The author was born on September 13, 1925, in Plymouth, Pennsylvania, where he attended public schools. In February, 1943, during his senior year at the Ward P. Davenport High School, he entered Bucknell University Junior College. In 1944, he enlisted in the United States Naval Reserve and among various assignments, attended Bucknell University from March, 1944 to February, 1945 under the Navy V-12 Program. Upon release to inactive duty in 1946, the author resumed studies at Bucknell University. After receiving the degree of Bachelor of Science from that institution in June, 1947, he entered the Graduate College of the University of Illinois. He held a half-time teaching assistantship from September, 1947 to June, 1948, a University Fellowship from September, 1948 to June, 1949, and an Upjohn Fellowship in the academic year 1949-1950.

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